

# **HYPERTENSION BOARD REVIEW 2004**

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# OVERVIEW

- **Utilize in-training examination and AAFP core content review questions to help review:**
  - General facts and key messages
  - Blood pressure (BP) measurement and clinical evaluation
  - Prevention and treatment of high BP
  - Special populations and situations
- **Discuss and compare any major changes in the above in JNC VII**

# GENERAL FACTS

- JNC VI (Joint National Committee sixth report) 1997
- JNC VII (express) May 2003
- JNC VII (full report) Dec 2003

# Why JNC VII?

- Many new HTN trials since JNC VI in 1997
- Need for concise guideline and simplification of BP classification
- Recognition that the JNC reports did not result in maximum benefit to the public
  - 2/3 of HTN patients still have BP  $>140/90$
  - Rate of decline of death from CHD and stroke has slowed
  - HF prevalence and hospitalizations increasing
  - ESRD diagnosis increasing

# GENERAL FACTS

- A 40 y/o sedentary WM with a FmHx of stroke sees you for a health maintenance visit. His BP=150/100 mmHg and an LDL cholesterol of 170 mg/dl
- Which one of the following would have the greatest impact on decreasing his future risk of stroke?
  - A program of regular physical exercise
  - Aspirin 81 mg daily
  - Reduction of LDL to <130 mg/dl
  - Reduction of BP to normal

# GENERAL FACTS

## Answer:

- D) Reduction of BP to normal
  - **Stroke is the 3rd leading cause of death in the US**
  - **HTN is the most consistently powerful predictor of stroke**
    - Primary prevention of stroke. *N Engl J Med* 1995
  - **Lowering BP results in 35-40% reduction in stroke incidence**

# NEW FEATURES AND KEY MESSAGES

- **Hypertension (HTN) affects 50 million in U.S and one billion worldwide**
- **If normotensive at age 55 →**
  - 90 % lifetime risk for developing HTN**
- **BP and risk of CVD events is continuous, consistent, and independent of other risk factors**
  - Risk of CVD beginning at 115/75 mmHg doubles with each increment of 20/10**

# NEW FEATURES AND KEY MESSAGES

- **SBP is a more important CVD risk factor than DBP except in patients younger < 50**
- **If BP is >20/10 mmHg above goal, drug therapy should be initiated with two agents**
  - One usually should be a Thiazide-type diuretic
- **Motivation improves compliance**
  - Motivation improves with trust in the clinician
  - ***Empathy builds trust → potent motivator***

# CLASSIFICATION

	<u>JNCVI</u>	<u>Systolic BP</u>	<u>Diastolic</u>
<u>Category</u>			
<u>BP</u>			
• Optimal	→	<120	and
• Normal	→	<130	and
• High-normal	→	130-139	or
85-89			
• HTN			
99	-Stage 1	140-159	or
109		(67%)	90-
	-Stage 2	160-179	or
		(22%)	100-
	Stage 3	>180	or
			>110

# CLASSIFICATION

<u>Category</u>	<u>JNCVII</u>	<u>Systolic BP</u>	<u>Diastolic</u>
<u>BP</u>			
• Normal		$<120$ and $<80$	
• PREHTN		$120-139$	$80-$
• Hypertension			
	-Stage 1	$140-159$	$90-$
		-Stage 2	$\geq 160$ or $\geq 100$

# BP MEASUREMENT

**Which of the following factors can lower blood pressure readings?**

- A) Obese extremities**
- B) Caffeine ingestion**
- C) Narrow BP cuff**
- D) Supporting the patient's back**



# BP MEASUREMENT

## Answer:

**D) Supporting the patient's back**

- relaxes the body, lowering BP an avg of 8 mmHg SBP and DBP

**Obese extremities**

**Caffeine ingestion** can result in  
**false Narrow BP cuff elevations**

# BP MEASUREMENT

- Measurement of BP should be obtained:
  - In all adults (age >18) at each visit
  - > 30 minutes after use of nicotine or caffeine
  - After 5 minutes of rest with arm supported at heart level
  - With *appropriate sized cuff*
    - bladder should encircle 80% of the arm

# BP MEASUREMENT

- Measurement of BP should be obtained:
  - Twice, at least two minutes apart
    - repeat if  $>5$  mm pressure difference
  - With patient seated with feet flat on floor, back and arm supported, and arm at heart level
  - Use manual mercury sphygmomanometer or recently calibrated aneroid manometer or validated automated device (JNCVI and VII)

# BP MEASUREMENT

- **Ambulatory Blood Pressure Monitor (ABPM) is warranted for evaluation of “white-coat” HTN in the absence of target organ injury**
  - It is also helpful to assess patients with:
    - apparent drug resistance
    - hypotensive symptoms with antihypertensives
    - episodic HTN
    - autonomic dysfunction
  - Correlates better than office measurements with target organ injury
  - BP should drop 10 to 20% during the night
    - If not → increased risk for CV events

# BP MEASUREMENT

- **Self measurement of BP**
  - An avg BP more than 135/85 mmHg measured at home is generally considered to be **hypertensive**
  - **Wrist and finger manometers are not recommended**



# CLINICAL EVALUATION

**Which one of the following would be most likely to have secondary HTN?**

- A) 39 y/o WM who weighs 119 kg and BP=142/94**
- B) 48 y/o AAF with LVH on echo and BP=162/98**
- C) 62 y/o AAM with a strong FmHx of HTN**
- D) 78 y/o WF with abdominal bruits and BP=182/102**
- E) 88 y/o WM with hemiparesis due to previous stroke whose BP=192/88**

# **CLINICAL EVALUATION**

## **Answer:**

**D) 78 y/o WF with abdominal bruits and BP is 182/102 mm Hg**

**Objective of the clinical evaluation:**

- 1) Identify other CV risk factors**  
**- assess lifestyle and concomitant disorders that may affect prognosis and guide treatment**
- 2) To reveal identifiable causes of high BP and**
- 3) To assess the presence or absence of target organ damage and CVD**

# Major Risk Factors

JNCVI

JNCVII

- **Age > 60 years**
- **Sex (men and postmenopausal women)**
- **Family of CAD**

- **Age (> 55 for men, >65 for women)**
- **Obesity (BMI >30 kg/m<sup>2</sup>)**
- **Physical inactivity**
- **Microalbuminuria or estimated GFR <60 mL/min**  
(HOPE trial *N Engl J Med.* 2000)

# **SECONDARY HYPERTENSION**

- **Sleep apnea**
- **Chronic kidney disease**
- **Primary aldosteronism**
- **Renovascular disease**
- **Chronic steroid therapy and Cushing's syndrome**
- **Pheochromocytoma**
- **Coarctation of the aorta**
- **Thyroid or parathyroid disease**

# **SECONDARY HYPERTENSION**

- **Drug-induced or related causes**
  - **NSAIDs**
  - **Cocaine, amphetamines, other illicit drugs**
  - **Sympathomimetics, oral contraceptives, steroids**
  - **Cyclosporine and tacrolimus**
  - **Erythropoietin**
  - **Selected OTC dietary supplements and medicines (e.g., ephedra, ma huang, bitter orange)**

# **TARGET ORGAN DAMAGE**

- **Heart**
  - **Left ventricular hypertrophy**
  - **Angina or prior myocardial infarction**
  - **Prior coronary revascularization**
  - **Heart failure**
- **Brain**
  - **Stroke or transient ischemic attack**
- **Chronic kidney disease**
- **Peripheral arterial disease**
- **Retinopathy**

# **CLINICAL EVALUATION**

- **Other historical factors that may affect treatment decisions**
  - **Gout, sexual dysfunction, bronchospasm, migraine, heart block, pregnancy plans in female**
- **Physical Examination**
  - **Goal is to assess for target organ damage and clues to secondary causes**

# **CLINICAL EVALUATION**

- **Laboratory and other testing**
  - Serum chemistries (fasting glucose, electrolytes, renal function)
  - Blood counts, lipid panel, urine analysis, EKG
  - Additional evaluations to consider include microalbuminuria, TSH, calcium, uric acid and echocardiography

# PREVENTION AND TREATMENT

JNCVI  
Lifestyle Modifications

- Lose weight if overweight.
- Limit alcohol intake to no more than 1 oz (30 mL) ethanol (e.g., 24 oz [720 mL] beer, 10 oz [300 mL] wine, or 2 oz [60 mL] 100-proof whiskey) per day or 0.5 oz (15 mL) ethanol per day for women and lighter weight people.
- Increase aerobic physical activity (30 to 45 minutes most days of the week).
- Reduce sodium intake to no more than 100 mmol per day (2.4 g sodium or 6 g sodium chloride).
- Maintain adequate intake of dietary potassium (approximately 90 mmol per day).
- Maintain adequate intake of dietary calcium and magnesium for general health.
- Stop smoking and reduce intake of dietary saturated fat and cholesterol for overall cardiovascular health.

# PREVENTION AND TREATMENT

JNCVII

## Lifestyle Modifications

- Dietary Approaches to Stop Hypertension (DASH) diet *N Engl J Med.* 2001

# Lifestyle Modifications

<u>Modification</u>	<u>Recommendation</u>	<u>SBP Reduction</u>
• Weight reduction	BMI <u>18.5-24.9</u>	<u>n</u> 5-20 mmHg/10 kg wt loss
• Adopt DASH eating plan	-diet rich in fruits, vegetables, and lowfat dairy products -reduced saturated and total fat	8-14 mmHg
• Dietary sodium reduction	No more than 2.4 g sodium/day	2-8 mmHg

# Lifestyle Modifications<sub>SBP</sub>

• <u>Modification</u>	<u>Recommendation</u>	<u>Reductio</u> <u>n</u>
• Physical activity	Regular aerobic physical activity $\geq$ 30 min/day, most days of the week	4-9 mmHg
• Moderation of alcohol consumption	No more than 2 drinks/day in most men and No more than 1 drink/day in women	2-8 mmHg

# GOALS OF THERAPY

## JNCVI

- Goal BP:
  - HTN:  $<140/90$
  - Diabetics:  $<130/85$
  - Renal failure:  $<130/85$
  - Proteinuria ( $>1$  gm/24 hrs):  $<125/75$

## JNCVII

- Goal BP:
  - HTN:  $<140/90$
  - Diabetics:  $<130/80$
  - Renal failure:  $<130/80$

# GOALS OF THERAPY

- **Base medication decisions on:**
  - compelling indications
  - comorbid conditions
  - side effect profile
  - drug interactions
  - cost
- **Always favor the long-acting formulations**

# ANTIHYPERTENSIVE MEDICATIONS

## JNCVI

- Uncomplicated HTN
  - Diuretics
  - $\beta$ -blockers

## JNCVII

- Uncomplicated HTN
  - Thiazide diuretics
  - Either alone or in combination with an ACE-I, ARB,  $\beta$ -blocker, or CCB

# ANTIHYPERTENSIVE MEDICATIONS

JNCVI

## Compelling Indications

- **Diabetes mellitus (type 1) with proteinuria**
  - ACE-I
- **Heart failure**
  - ACE-I, Diuretics
- **Isolated systolic HTN (elderly)**
  - Diuretics preferred, Long-acting dihydropyridine CCB
- **Myocardial infarction**
  - $\beta$  -blockers (non-ISA), ACE-I (with systolic dysfunction)

# ANTIHYPERTENSIVE MEDICATIONS

JNCVII

## Compelling Indications

- **Diabetes mellitus (type 1) with proteinuria**

- **Heart failure**

- **High coronary disease risk**

→ Diuretic,  $\beta$  -blocker, ACE-I, ARB, CCB

→ Diuretic,  $\beta$  -blocker, ACE-I, ARB, and aldo antagonist

→ Diuretic,  $\beta$  -blocker, ACE-I, CCB

# ANTIHYPERTENSIVE MEDICATIONS

JNCVII

## Compelling Indications

- Post Myocardial infarction
- Chronic kidney disease
- Recurrent stroke prevention

→  $\beta$  -blockers, ACE-I, aldo antagonist (w/ HF)

ACE-I, ARB

Diuretic, ACE-I

# ANTIHYPERTENSIVE MEDICATIONS

## Additional considerations:

- Diuretics
  - Compelling indications: DM, HF, high CAD risk, recurrent stroke prevention
  - May have favorable effects on: osteoporosis (thiazides)
  - May have unfavorable effects on: DM (hyperglycemia at higher doses), dyslipidemia (high dose), gout (> in men), hyponatremia (> in women)

# ANTIHYPERTENSIVE MEDICATIONS

## Additional considerations:

### forall $\beta$ -blockers

- Compelling indications: DM, HF, post-MI, high CAD risk
- May have favorable effects on: atrial tachycardia and a-fib, essential tremor, thyrotoxicosis, migraine, peri-operative hypertension
- May have unfavorable effects on: asthma, 2<sup>nd</sup> or 3<sup>rd</sup> degree heart

# ANTIHYPERTENSIVE MEDICATIONS

## Additional considerations:

- ACE-I
  - Compelling indications: DM, HF, post-MI, high risk CAD, chronic kidney disease, recurrent stroke prevention
  - May have unfavorable effects on: hyperkalemia
  - Contraindicated in pregnancy

# ANTIHYPERTENSIVE MEDICATIONS

## Additional considerations:

- ARB
- **Compelling indications: DM, HF, chronic kidney disease**
- **Contraindicated in pregnancy**

# ANTIHYPERTENSIVE MEDICATIONS

## Additional considerations:

- CCB
- Compelling indications: DM, high CAD risk
- May have favorable effects on: Raynaud's syndrome and certain arrhythmias

# ANTIHYPERTENSIVE MEDICATIONS

## Additional considerations:

- Aldosterone antagonist
  - Compelling indications: HF, Post-MI (w/ LV dysfunction)
  - May have unfavorable effects on: hyperkalemia

# QUESTION

**The following are statements about the use of diuretics for the treatment of HTN:**

**True or False**

**A) Diuretic therapy has been demonstrated to decrease mortality rates in patients with HTN**

**True**

**B) Thiazide diuretics have been shown to reduce the incidence of stroke in elderly individuals with isolated systolic HTN**

**True**

# QUESTION

- C) **Thiazide diuretics have been demonstrated to be as effective as the CCB amlodipine or ACE-I lisinopril in preventing nonfatal MI**  
**True**
- D) **When combined with other classes of HTN meds, low-dose diuretics can improve BP control**  
**True**
- E) **In patients with HTN and normal renal function, loop diuretics, such as furosemide, are generally more effective than thiazide diuretics**  
**False**

From: AAFP Core Content Review of Family Medicine 2003

# TREATMENT

- **ALLHAT trial**
  - **chlorthalidone was as effective as amlodipine or lisinopril in preventing fatal CAD and nonfatal MI**
- **Diuretics have been shown to:**
  - **decrease mortality in patients with HTN**
  - **reduce incidence of CV events and stroke in the elderly with isolated systolic HTN**

# TREATMENT

- Thiazide diuretics → not as effective in patients with creatinine clearances below 30 - 50 ml/min
- Loop diuretics → less effective than thiazides for patients with HTN and normal renal function

# ALLHAT

## The Antihypertensive and Lipid Lowering Treatment to Prevent Heart Attack Trial

- **Study design: randomized, prospective, double-blinded over ~five years**
- **Population: 42,418 individuals > 55 y/o with mild (Stage 1 or 2) HTN with at least one other CV risk factor - randomized to one of four arms**

# ALLHAT

- Intervention: 3 arms
  - 1) CCB - amlodipine
  - 2) Alpha-blocker - doxazosin
  - 3) ACE-I - lisinopril
- Control:  
Diuretic - chlorthalidone

A second drug could be added to achieve BP control (atenolol, clonidine, or reserpine)

# ALLHAT

- **Outcomes measured:**
  - **Primary outcomes:** fatal coronary heart disease and nonfatal MI  
**(no difference between between the drug groups)**

# MORE QUESTIONS

**Which one of the following antihypertensive agents can be given to diabetic patients without adversely affecting glucose metabolism?**

- A) Hydrochlorothiazide**
- B) Chlorthalidone**
- C) Prazosin**
- D) Propranolol**
- E) Diazoxide**

**Answer:**

**C) Prazosin**

- **Prazosin, a peripheral alpha blocker, has no known adverse effects on glucose tolerance**
- **Thiazide diuretics and Diazoxide can worsen hyperglycemia**
- ✓  **$\beta$  -blockers may induce or mask hypoglycemia**

# **MORE QUESTIONS**

**A 50 y/o WM with elevated cholesterol requires medication for HTN. Which one of the following can adversely affect the lipid profile?**

- A) ACE inhibitors**
- B) Calcium channel blockers**
- C) Alpha blockers**
- D)  $\beta$  -blockers**

**Answer:**

**D)  $\beta$  -blockers**

**$\forall \beta$  -blockers can raise triglycerides and lower HDL**

- The other drugs listed have no adverse effects on lipids**

# MORE QUESTIONS

**A 40 y/o man currently being treated for HTN abruptly stops his medication. He presents to your office with significantly elevated BP, palpitations, anxiety, and headache.**

**The patient was most likely taking**

- A) prazosin**
- B) clonidine**
- C) hydrochlorothiazide**
- D) hydralazine**
- E) captopril**

**Answer:**

**B) clonidine**

- **Withdrawal of clonidine may produce a hypertensive crisis**
  - **Accompanied by signs and symptoms consistent with sympathetic overactivity**

# Questions?